IN THE SPECIFICATION

Please replace the paragraph **[0030]** at page 16 with the following text:

In the first, second and third embodiments, the movable element 2 may be equipped with a permanent magnet while the stator 1 may be equipped with an electromagnet. Also, besides the sensor 6, [[an]] a magnetic induction ~~inclinometer~~ device or a photo-sensor may be used. For example, a photo sensor may be provided in the stator 1 while a slit, a light emitting element and a light receiving element may be provided in the movable element 2.

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (original): A controlling apparatus for controlling a linear oscillation motor having a movable element and a stator one of which comprises an electromagnet with a winding, the controlling apparatus comprising:

a sensor configured to detect movement of the movable element; and

a controller configured to intermittently supply electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor.

Claim 2 (original): A controlling apparatus according to Claim 1, wherein the sensor comprises an inducing device configured to induce voltage according to the movement of the movable element.

Claim 3 (original): A controlling apparatus according to Claim 1, wherein the controller is configured to begin said each intermittent supply of electric power to the winding at a timing when a predetermined time has elapsed from a reference timing at which a velocity of the movable element detected by the sensor is maximum.

Claim 4 (original): A controlling apparatus according to Claim 3, wherein the sensor comprises the winding of the electromagnet, and the controller is configured to prohibit supply of electric power to the winding during a period including the reference timing.

Claim 5 (original): A controlling apparatus according to Claim 1, wherein the controller is configured to begin said each intermittent supply of electric power to the winding at a timing when a predetermined time has elapsed from a reference timing at which an absolute value of induced voltage in the winding of the electromagnet increases or decreases to be equal to a predetermined reference absolute value.

Claim 6 (original): A controlling apparatus according to Claim 5, wherein the sensor comprises the winding of the electromagnet, and the controller is configured to prohibit supply of electric power to the winding during a predetermined period.

Claim 7 (currently amended): A controlling apparatus according to Claim 1, wherein the sensor comprises [[an]] a magnetic induction ~~inclinometer~~ device.

Claim 8 (original): A controlling apparatus according to Claim 1, wherein the sensor comprises a photo-sensor.

Claim 9 (original): A controlling apparatus according to Claim 1, wherein the sensor is configured to detect position, velocity and/or acceleration of the movable element.

Claim 10 (original): A controlling apparatus according to Claim 1, wherein the controller comprises,

an output controlling device configured to control current supplied to the winding of the electromagnet, and

a drive control device configured to control the output controlling device to control a timing of current supply control.

Claim 11 (original): A controlling apparatus according to Claim 2, further comprising an induced voltage calculator configured to calculate induced voltage in the inducing device according to the movement of the movable element based on voltage of the inducing device.

Claim 12 (original): A controlling apparatus according to Claim 11, wherein the induced voltage calculator is configured to calculate the induced voltage based on current and the voltage of the inducing device.

Claim 13 (original): A controlling apparatus according to Claim 10,

wherein the sensor comprises an inducing device which is configured to induce voltage according to the movement of the movable element, and

wherein the controlling apparatus further comprises an induced voltage calculator configured to calculate induced voltage in the inducing device according to the movement of the movable element based on voltage of the inducing device, the induced voltage calculator having a plurality of equations which is used to calculate the induced voltage depending on a status of the current supply control.

Claim 14 (original): A controlling apparatus according to Claim 10, further comprising:

an induced voltage calculator configured to calculate induced voltage in the inducing device according to the movement of the movable element based on voltage of the inducing device;

a voltage normalizing device configured to normalize the induced voltage calculated by the induced voltage calculator; and

a reference timing generator configured to generate a reference timing at which normalized voltage normalized by the voltage normalizing device is equal to a predetermined voltage.

Claim 15 (original): A controlling apparatus according to Claim 11, wherein the inducing device comprises the winding of the electromagnet.

Claim 16 (original): A controlling apparatus according to Claim 1, further comprising

an amplitude detector configured to detect an amplitude of oscillation of the movable element based on the output of the sensor, wherein the controller is configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element when the amplitude of the oscillation of the movable element is less than a predetermined first amplitude.

Claim 17 (original): A controlling apparatus according to Claim 16, wherein the controller is configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element during a predetermined period.

Claim 18 (original): A controlling apparatus according to Claim 1, further comprising a driving selector through which a driving condition of the movable element is selected, wherein the controller is configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element when a strong driving condition is selected via the driving selector.

Claim 19 (original): A controlling apparatus according to Claim 16, wherein the controller is configured to supply maximum electric power to the winding when the amplitude of the oscillation of the movable element is less than a predetermined second amplitude which is smaller than the predetermined first amplitude.

Claim 20 (original): A controlling apparatus according to Claim 16, wherein the controller is configured to change the supply of electric power to the winding according to the amplitude of the oscillation of the movable element.

Claim 21 (original): A controlling apparatus according to Claim 16, wherein the controller is configured to increase a frequency of the electric power supplied to the winding and to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element when the amplitude of the oscillation of the movable element is less than a predetermined first amplitude.

Claim 22 (original): A controlling apparatus according to Claim 1, wherein the controller is configured to intermittently supply electric power to the winding of the electromagnet to provide the movable element with force in only one direction.

Claim 23 (original): A linear oscillation motor comprising:

a movable element;

a stator, one of the movable element and the stator comprising an electromagnet with a winding;

a sensor configured to detect movement of the movable element; and

a controller configured to intermittently supply electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor.

Claim 24 (original): A linear oscillation motor comprising:

a rotor;

a stator, one of the rotor and the stator comprising an electromagnet with a winding;

a sensor configured to detect movement of the movable element;

a controller configured to intermittently supply electric power to the winding of the electromagnet to rotate the rotor periodically changing a rotational direction of the rotor, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center at which the rotor changes its rotational direction; and

an oscillatory element configured to be moved reciprocally and linearly by rotation of the rotor.

Claim 25 (original): A method for controlling a linear oscillation motor having a movable element and a stator one of which comprises an electromagnet with a winding, the method comprising:

detecting movement of the movable element;

supplying electric power intermittently to the winding of the electromagnet to move the movable element reciprocally and linearly; and

beginning each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor.

Claim 26 (original): A controlling apparatus for controlling a linear oscillation motor having a movable element and a stator one of which comprises an electromagnet with a winding, the controlling apparatus comprising:

sensor means for detecting movement of the movable element; and

controlling means for intermittently supplying electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controlling means beginning each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor means.

Claim 27 (original): A linear oscillation motor comprising:

a movable element;

a stator, one of the movable element and the stator comprising an electromagnet with a winding;

sensor means for detecting movement of the movable element; and

controlling means for intermittently supplying electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controlling means beginning each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor means.

Claim 28 (original): A linear oscillation motor comprising:

a rotor;

a stator, one of the rotor and the stator comprising an electromagnet with a winding;

sensor means for detecting movement of the rotor;

controlling means for intermittently supplying electric power to the winding of the electromagnet to rotate the rotor periodically changing a rotational direction of the rotor, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center at which the rotor changes its rotational direction; and

oscillatory means for being moved reciprocally and linearly by rotation of the rotor.

REMARKS/ARGUMENTS

Favorable consideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-28 are presently pending in this application, Claim 7 having been amended by this amendment.

In the outstanding Office Action, Claim 7 was rejected under 35 U.S.C. §112, second paragraph, for being indefinite; Claims 1-5, 8-11, 16, 17, 20, 21, 23 and 25-27 were rejected under 35 U.S.C. §103(a) as being unpatentable over Amaya et al. (U.S. Patent 5,955,799 A) in view of Tanina (U.S. Patent 5,869,944 A); Claims 6 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Amaya et al., and further in view of Dvorkis et al. (U.S. Patent 6,348,773 B1); and Claim 22 was rejected under 35 U.S.C. §103(a) as being unpatentable over Amaya et al., and further in view of Barkan (U.S. Patent 5,280,163 A). However, Claims 24 and 28 were indicated as allowed and Claims 12-14, 18 and 19 were indicated as including allowable subject matter.

First, Applicants acknowledge with appreciation the indication that Claims 24 and 28 have been allowed and that Claims 12-14, 18 and 19 include allowable subject matter. However, Claims 12-14, 18 and 19 are presently maintained in their respective dependent forms, because Applicants believe that Claim 1 includes allowable subject matter.

With regard to the rejection under 35 U.S.C. §112, second paragraph, the specification and Claim 7 have been amended as supported by page 20, paragraph 64, line 8, of Japanese Patent Application No. 2001-361720 which has been incorporated by reference in the specification, and thus the subject matter recited in Claim 7 is now believed to be clarified without new matter and in compliance with the requirements of the statute. If, however, the Examiner disagrees, the Examiner is invited to telephone the undersigned who will be happy to work in a joint effort to derive mutually satisfactory claim language.

Briefly recapitulating, Claim 1 of the present invention is directed to a controlling apparatus for controlling a linear oscillation motor having a movable element and a stator one of which comprises an electromagnet with a winding, and the controlling apparatus includes a sensor configured to detect movement of the movable element, and a controller configured to intermittently supply electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor.

Tanina discloses a motor driving apparatus. Nevertheless, it is respectfully submitted that Tanina does not teach "a controller configured to intermittently supply electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, *the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor*" as recited in Claim 1 (emphasis added in Italic). Specifically, Tanina discloses a motor driving apparatus which enables direct pulse width modulation driving in *a sensor-less motor*, and according to Tanina, the motor driving apparatus includes a pulse width modulating unit which outputs pulse width modulated signals for rotationally driving the motor *based upon a rotational error signal of the motor*.[1] Furthermore, Tanina simply discloses that "[f]or driving such iron-core motor (three phase motor 1), the current supply is preferably advanced in phase to a slight extent for correcting the delay in the driving current due to coil inductance," and does not disclose nor suggest beginning each intermittent supply of electric

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[1] MPEP 2141.02, citing *W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. Denied, 469 U.S. 851 (1984)*, states "[d]istilling an invention down to the "gist" or "thrust" of an invention disregards the requirements of analyzing the subject matter "as a whole"" and "[a] prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention."

power to the winding at a timing before a dead center of the movable element based on an output of the sensor which detects movement of the movable element. Therefore, Applicants respectfully submit that the structure recited in Claim 1 is believed to be clearly distinguishable from Tanina.

Amaya et al. disclose a linear vibration motor and a method for controlling vibration thereof. However, as indicated in the outstanding Office Action, Amaya et al. fail to teach "a controller configured to intermittently supply electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor" as recited in Claim 1. Thus, the structure recited in Claim 1 is clearly distinguishable from Amaya et al.

Dvorkis et al. and Barkan disclose a laser scanner for controlling the optical scanning of bar codes and a drive circuit for resonant motors, respectively, but neither Dvorkis et al. nor Barkan teaches "a controller configured to intermittently supply electric power to the winding of the electromagnet to move the movable element reciprocally and linearly, the controller being configured to begin each intermittent supply of electric power to the winding at a timing before a dead center of the movable element based on an output of the sensor" as recited in Claim 1. The structure recited in Claim 1 is therefore distinguishable from both Dvorkis et al. and Barkan.

Because none of Amaya et al., Tanina, Dvorkis et al. and Barkan discloses the controller as recited in Claim 1, even the combined teachings of these cited references are not believed to render the structure recited in Claim 1 obvious.

Likewise, Claims 23, 25, 26 and 27 are believed to include subject matter substantially similar to what is recited in Claim 1 to the extent discussed above. Thus,

Claims 23, 25, 26 and 27 are also believed to be distinguishable from Amaya et al., Tanina, Dvorkis et al. and Barkan.

For the foregoing reasons, Claims 1, 23, 25, 26 and 27 are believed to be allowable. Furthermore, since Claims 2-22 ultimately depend from Claim 1, substantially the same arguments set forth above also apply to these dependent claims. Hence, Claims 2-22 are believed to be allowable as well.

In view of the amendments and discussions presented above, Applicants respectfully submit that the present application is believed to be in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

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